1. Use the information to write the appropriate variation equation, and find y for the given values.

   y varies jointly as x and z. $y = \frac{40}{3}$ when $x = 5$ and $z = 4$. Find y when $x = 7$ and $z = 2$.

   [A] $y = \frac{2}{3}xz$; $\frac{28}{3}$ [B] $y = 3xz$; 42 [C] $y = \frac{4}{3}xz$; $\frac{56}{3}$ [D] $y = \frac{3}{2}xz$; 21

2. Determine whether the function is a rational function. If so, find the domain and identify the horizontal and vertical asymptotes, and any holes in the graph. If the function is not rational, state why not.

   $f(x) = \frac{4x+5}{x^2-6x+5}$

   [A] rational; $x \neq -\frac{5}{4}$ or 1; asymptotes at $y = 4$, $x = -\frac{5}{4}$ and $x = 1$

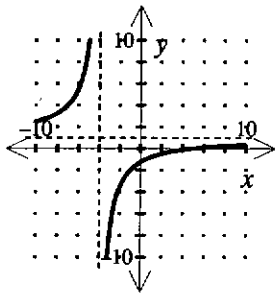
   [B] rational; $x \neq 1$ or 5; asymptotes at $y = 0$, $x = 1$ and $x = 5$

   [C] rational; $x \neq -1$ or -5; asymptotes at $y = 0$, $x = -1$ and $x = -5$

   [D] not rational; numerator is of lower degree than denominator

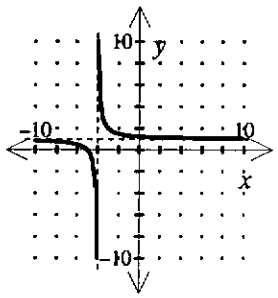
3. Which is the graph of the rational function $f(x) = \frac{x+5}{x+4}$? Identify the vertical and horizontal asymptotes.

   [A]

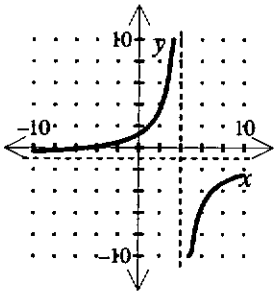
   asymptotes: $y = 1$, $x = -4$

   [B]

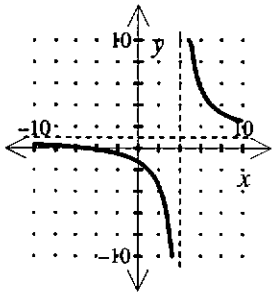
   asymptotes: $y = 1$, $x = -4$

   [C]

   asymptotes: $y = -1$, $x = 4$

   [D]

   asymptotes: $y = 1$, $x = 4$

Simplify the rational expression.

4. $\frac{x^2+11x+30}{x^2-25} \div \frac{x+6}{x-6}$ [A] $\frac{x-11}{x-5}$ [B] $\frac{11x+6}{5}$ [C] $\frac{x-6}{x-5}$ [D] $\frac{x+5}{x-6}$

Simplify the rational expression.

5. $\frac{x^2-1}{3x} \cdot \frac{10x}{x+1}$

[A] $\frac{(x+1)^2(x-1)}{30x^2}$ [B] $\frac{10(x-1)}{3}$

[C] $\frac{(x-1)^2(x+1)}{30x^2}$ [D] $\frac{10(x+1)}{3}$

6. Simplify.
$\frac{x-2}{2x^2} - \frac{-4x+3}{9x} + \frac{5x}{12}$

[A] $\frac{10x-3}{6x^3}$ [B] $\frac{15x^3+16x^2+30x-36}{36x^2}$

[C] $\frac{15x^3+16x^2+6x-36}{36x^2}$ [D] $\frac{10x+3}{6x^3}$

7. Evaluate the radical expression: $\frac{1}{5}\left(\sqrt[3]{-8}\right)^2$

[A] $-\frac{2}{25}$ [B] $\frac{4}{25}$ [C] $\frac{4}{5}$ [D] $-\frac{2}{5}$

8. Find the domain of the radical function.
$f(x) = -\sqrt{9-x}$

[A] $x \le -9\}$ [B] $x \ge 9$

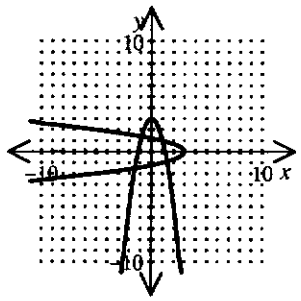
[C] $x \ge -9$ [D] $x \le 9$

9. Simplify the sum, difference, product, or quotient. Assume that the value of any variable is positive.
$\frac{\sqrt{20b^2r}}{\sqrt{4br}}$

[A] $\frac{\sqrt{5}}{\sqrt{b}}$ [B] $\sqrt{20b^2r}$ [C] $\sqrt{5b^2}$ [D] $\sqrt{5b}$

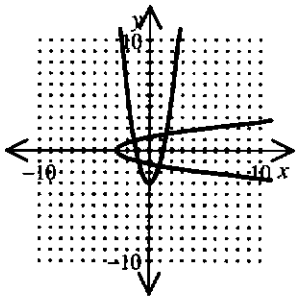
10. Which is the correct inverse of $y = 2x^2 - 3$ and the graph of both $y = 2x^2 - 3$ and its inverse on the same coordinate plane?

[A]



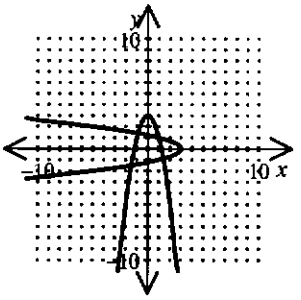
$y = \pm\frac{\sqrt{-(x-3)}}{2}$

[B]



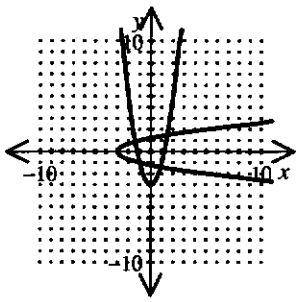
$y = \pm\frac{\sqrt{x+3}}{2}$

[C]



$y = \pm\sqrt{\frac{-(x-3)}{2}}$

[D]



$y = \pm\sqrt{\dfrac{x+3}{2}}$

11. Rationalize the denominator.

$$\frac{\sqrt{11}}{2+\sqrt{5}}$$

[A] $-5\sqrt{11}+\sqrt{22}$ [B] $-55\sqrt{11}+\sqrt{4}$

[C] $-11\sqrt{11}+\sqrt{10}$ [D] $-2\sqrt{11}+\sqrt{55}$

12. Solve the radical equation. If there is no real solution, write *no solution*.

$3\sqrt{3x+1}+2=\sqrt{27x+4}$

[A] $\dfrac{55}{48}$ [B] $\dfrac{103}{48}$ [C] $\dfrac{41}{48}$ [D] no solution

13. A population of 460 animals decreases at an annual rate of 17%. Find the multiplier for the rate of exponential decay.

[A] 1.17 [B] 0.83 [C] 0.17 [D] 1.83

14. Erosion gradually reduces the size of a small Pacific island that has a current area of just 240 acres. If the island's area decreases at an annual rate of 0.12%. Find the multiplier for the rate of exponential decay.

[A] 0.88 [B] 1.12 [C] 1.0012 [D] 0.9988

15. Find the final amount of the investment.
$3100 at 8% interest compounded monthly for 4 years.

[A] $4264.57 [B] $4217.52

[C] $4092.00 [D] $3348.00

16. Solve the equation for *x*.

$x = \log_5 625$

[A] 4 [B] $\dfrac{1}{4}$ [C] $-\dfrac{1}{4}$ [D] 5

17. Evaluate $\left(3^3\right)^{\log_{27} 6}$.

[A] 2 [B] 27 [C] 6 [D] 3

18. Write the expression as a single logarithm, and simplify if possible.

$\log_c 5x + 6(\log_c x - \log_c y)$

[A] $\log_c \dfrac{5x^7}{y^6}$ [B] $\log_c \dfrac{11x^2}{y}$

[C] $\log_c \dfrac{11x}{6y}$ [D] $\log_c \dfrac{30x^2}{y}$

19. Solve $\log_2(x+2) - \log_2(x-3) = \log_2 6$ for *x*.

[A] $\dfrac{2}{5}$ [B] 4 [C] 1 [D] −3

20. Solve the equation. Round your answers to the nearest hundredth.

$5^x = 25$

[A] 0.5 [B] 0.7 [C] 2 [D] 1.4

Use a graph, synthetic division, substitution, and factoring to solve the equation.

21. $x^3 + 6x^2 - 40x = 0$

[A] 0, 10, 4 [B] 0, −10, −4

[C] 0, 10, −4 [D] 0, −10, 4

22. $x^3 + x^2 - 10x + 8 = 0$

[A] −2, 1, −4 [B] −3, 1, −4

[C] 3, 1, −4 [D] 2, 1, −4

23. Find the real zeros of the function. Give approximate values to the nearest hundredth , if necessary.

$f(x) = x^3 + x^2 + 4$

[A] -2 [B] $-1, 2$ [C] $-2, 1$ [D] -1

24. Find all the zeros of the polynomial function.

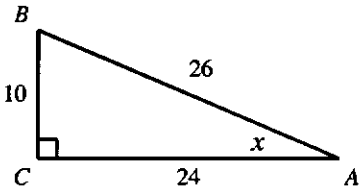
$f(x) = x^2 - 4x + 20$

[A] $-2 \pm 8i$ [B] $2 \pm 4i$

[C] $-2 \pm 4i$ [D] $2 \pm 8i$

Refer to ΔABC below to find the indicated value listed. Find the exact value and the value rounded to the nearest ten-thousandth, if necessary.

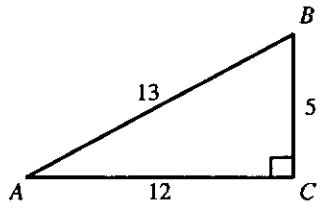
25. Find: tan X



[A] $\frac{12}{13}$ or 0.9231 [B] $\frac{12}{5}$ or 2.4

[C] $\frac{5}{13}$ or 0.3846 [D] $\frac{5}{12}$ or 0.4167

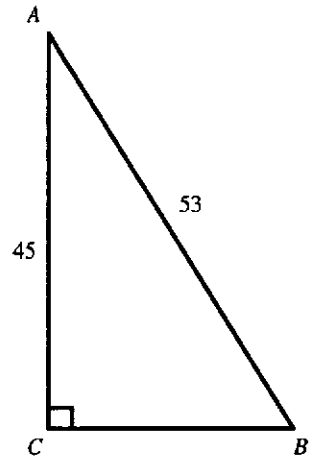
26. Find: csc A



[A] $\frac{5}{13}$ or 0.3846 [B] $\frac{13}{12}$ or 1.0833

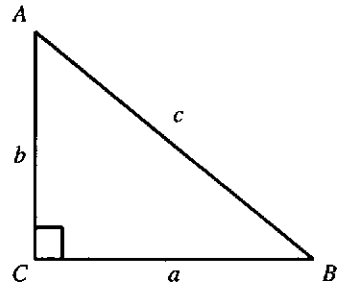
[C] $\frac{13}{5}$ or 2.6 [D] $\frac{12}{13}$ or 0.9231

27. For ΔABC, find the measure of $\angle A$ to the nearest degree.



[A] 58° [B] 40° [C] 32° [D] 42°

28. Use the following information to find the unknown sides and angles. $m\angle B = 30°$; $C = 20$



[A] $a = 16.4$; $b = 11.4$; $m\angle A = 60°$; $m\angle C = 90°$

[B] $a = 16.4$; $b = 10$; $m\angle A = 70°$; $m\angle C = 90°$

[C] $a = 17.3$; $b = 10$; $m\angle A = 60°$; $m\angle C = 90°$

[D] $a = 17.3$; $b = 11.4$; $m\angle A = 70°$; $m\angle C = 90°$

29. Convert 252° to radians.

[A] $\frac{14}{15}\pi$ [B] $\frac{14}{5}\pi$ [C] $\frac{7}{5}\pi$ [D] $\frac{7}{10}\pi$

30. Convert $\frac{13}{12}\pi$ to degrees.

[A] 380° [B] 195° [C] 390° [D] 205°